



Nitrogen & Nutrient Strategies for 2014

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Pioneer Agronomy Seminar
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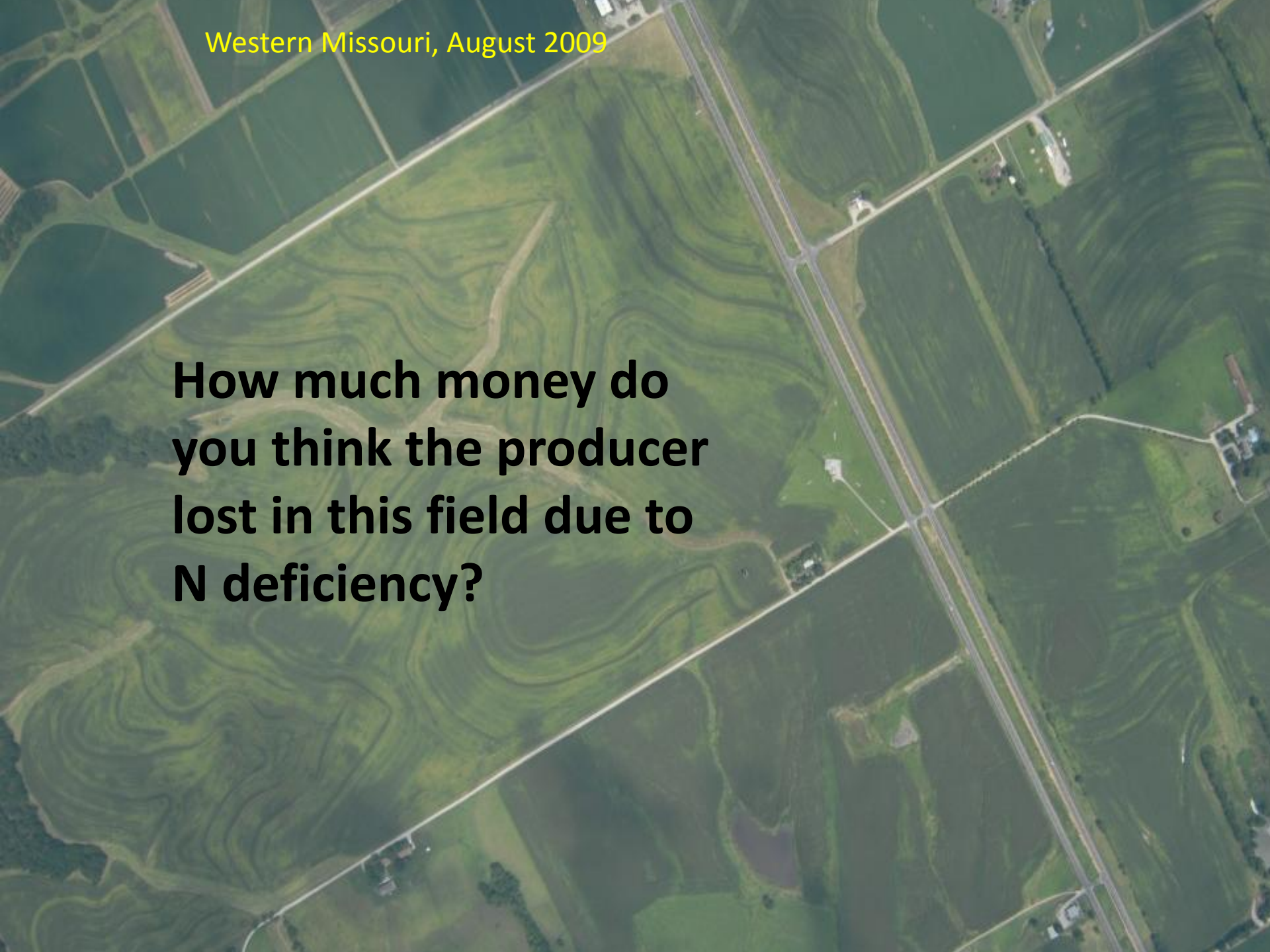
An aerial photograph of a vast, flat agricultural landscape in Central Iowa. The foreground and middle ground are dominated by large, rectangular fields of vibrant green corn. A light-colored dirt road or path runs diagonally across the lower portion of the frame. In the distance, the landscape transitions into a more varied terrain with patches of trees, smaller fields, and some buildings, all under a clear, bright sky.

**Strategy 1: Don't let
your corn look like this**

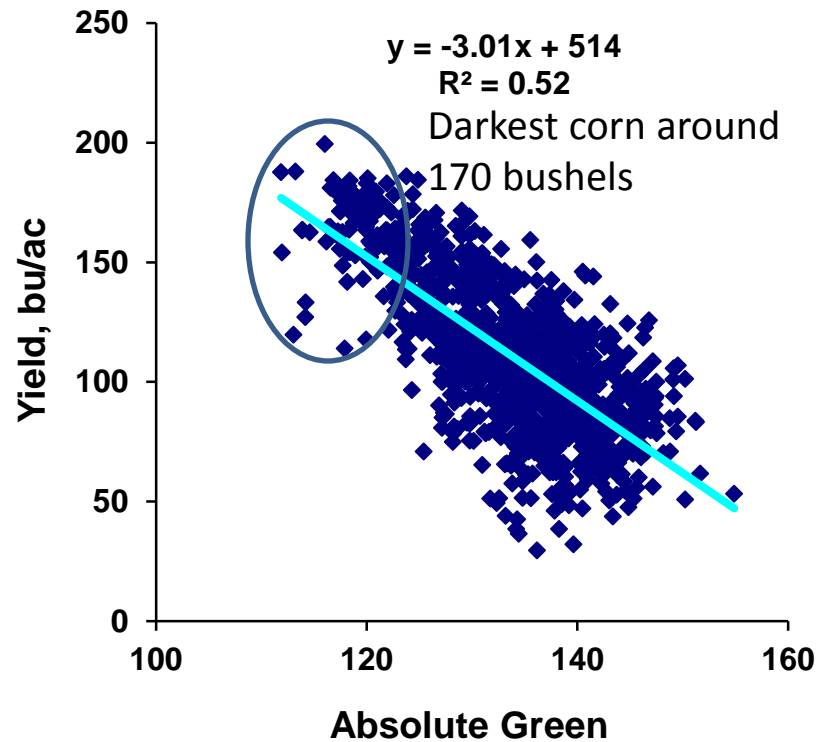
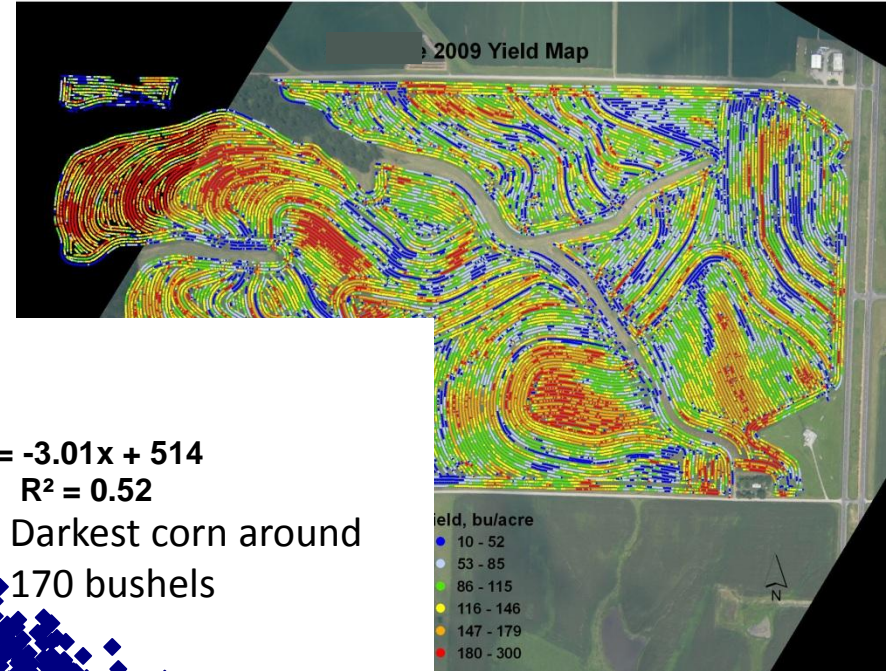
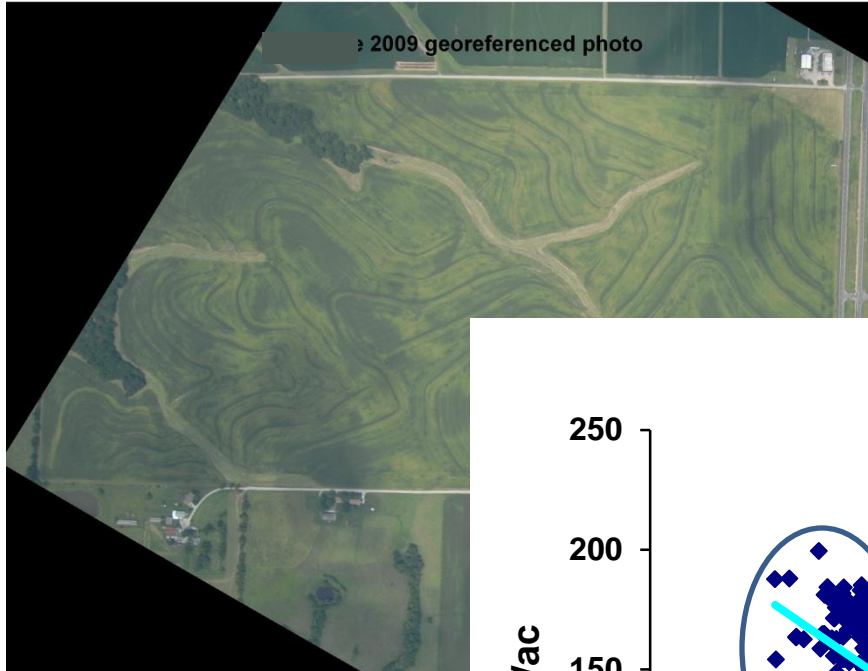
Central Iowa, August 2008

Western Missouri, August 2009

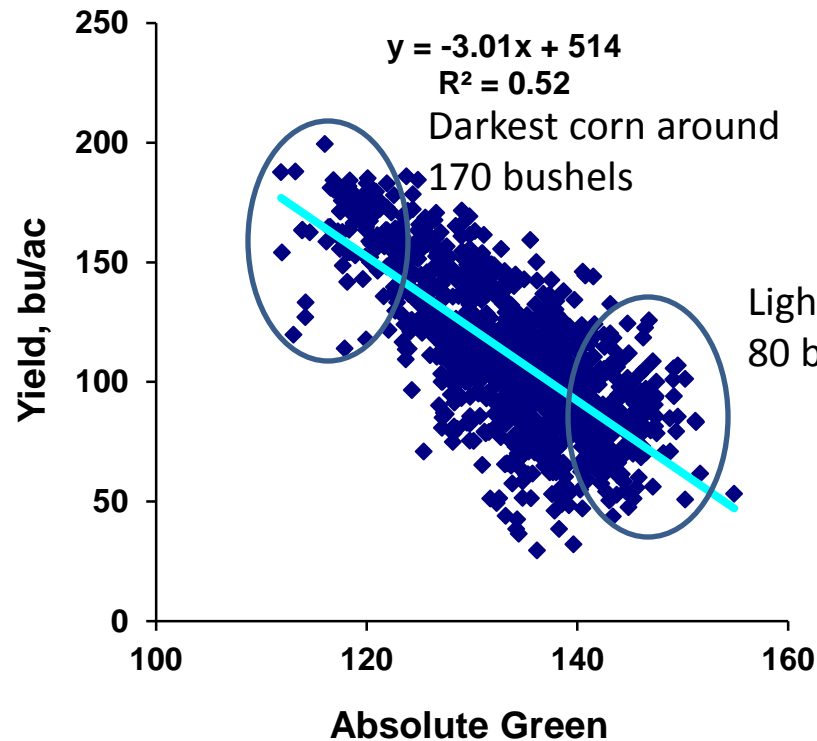
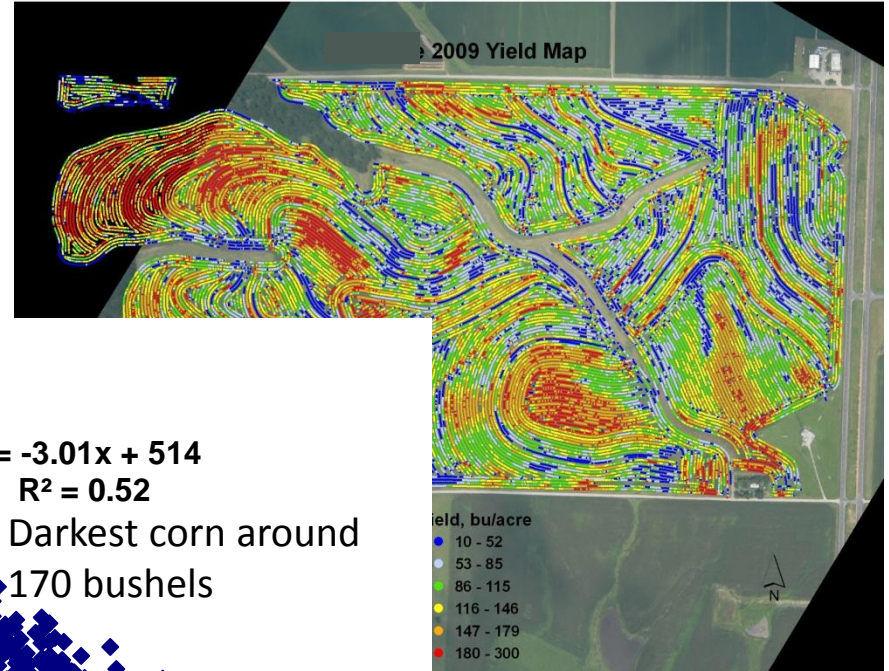
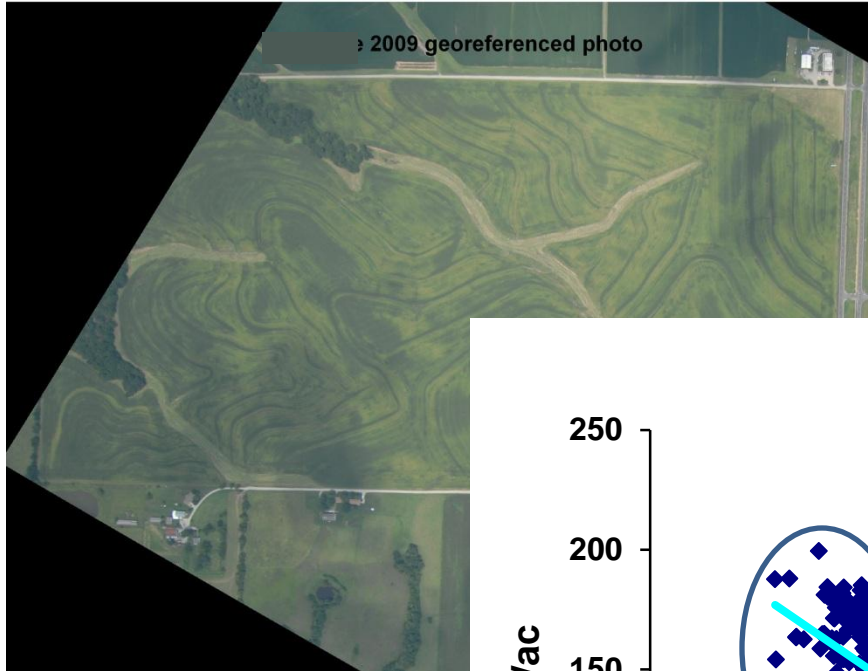
**How much money do
you think the producer
lost in this field due to
N deficiency?**



Yield map: yellow corn yielded poorly



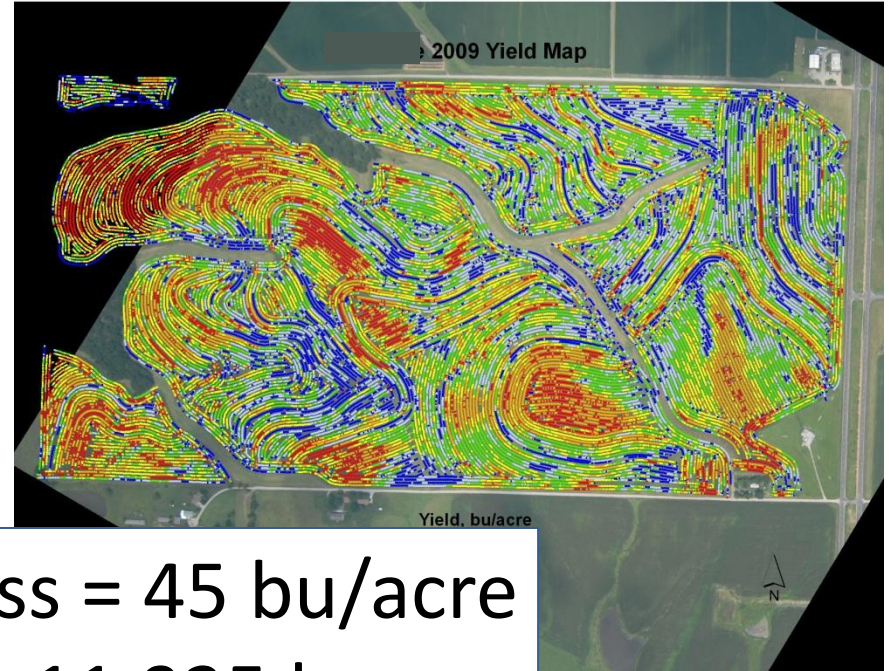
Yield map: yellow corn yielded poorly



Average yield 125 bushels

45 bushels less than dark green corn

N Deficiency costs a lot!



Average yield loss = 45 bu/acre

Total yield loss = 11,925 bu

(45 bu/ac x 265 acres)

Total economic loss = **\$44,720**

(11,925 bu x \$3.75/bu)

Western Missouri, August 2009

**How did this
corn get yellow?**



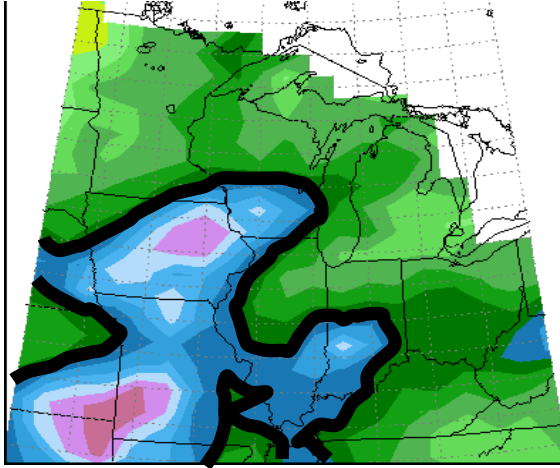


**Excess rainfall,
April to June**

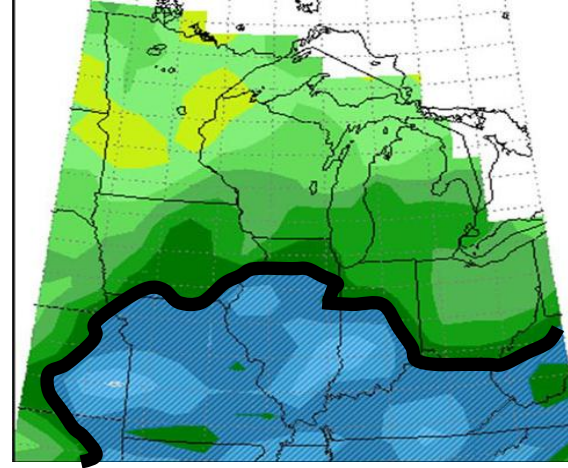
Four wet springs

Outlined areas > 16 inches rain April-June

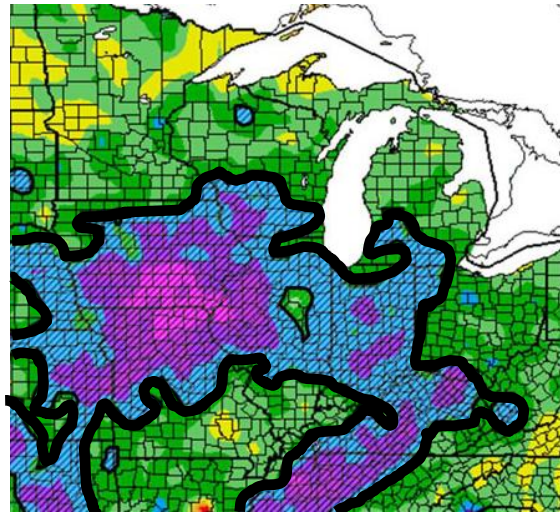
2008



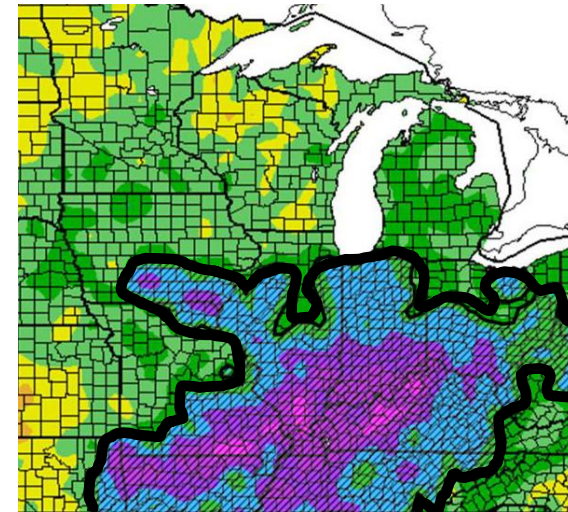
2009



2010



2011



An aerial photograph of a large agricultural field, likely corn, in Northwest Missouri during August 2008. The field is divided into several sections by a central vertical road and other smaller paths. The corn plants in the lower-left section appear significantly darker green and less dense compared to the surrounding areas, which are a vibrant, healthy green. This visual contrast illustrates the nitrogen deficiency mentioned in the text. The overall scene is a typical rural landscape with a mix of green fields and brown roads.

There was widespread N deficiency 2008-2011 across the Corn Belt

Northwest Missouri, August 2008

There was widespread N deficiency 2008-2011 across the Corn Belt



Central Illinois, August 2009

There was widespread N deficiency 2008-2011 across the Corn Belt

Western Illinois, June 2010

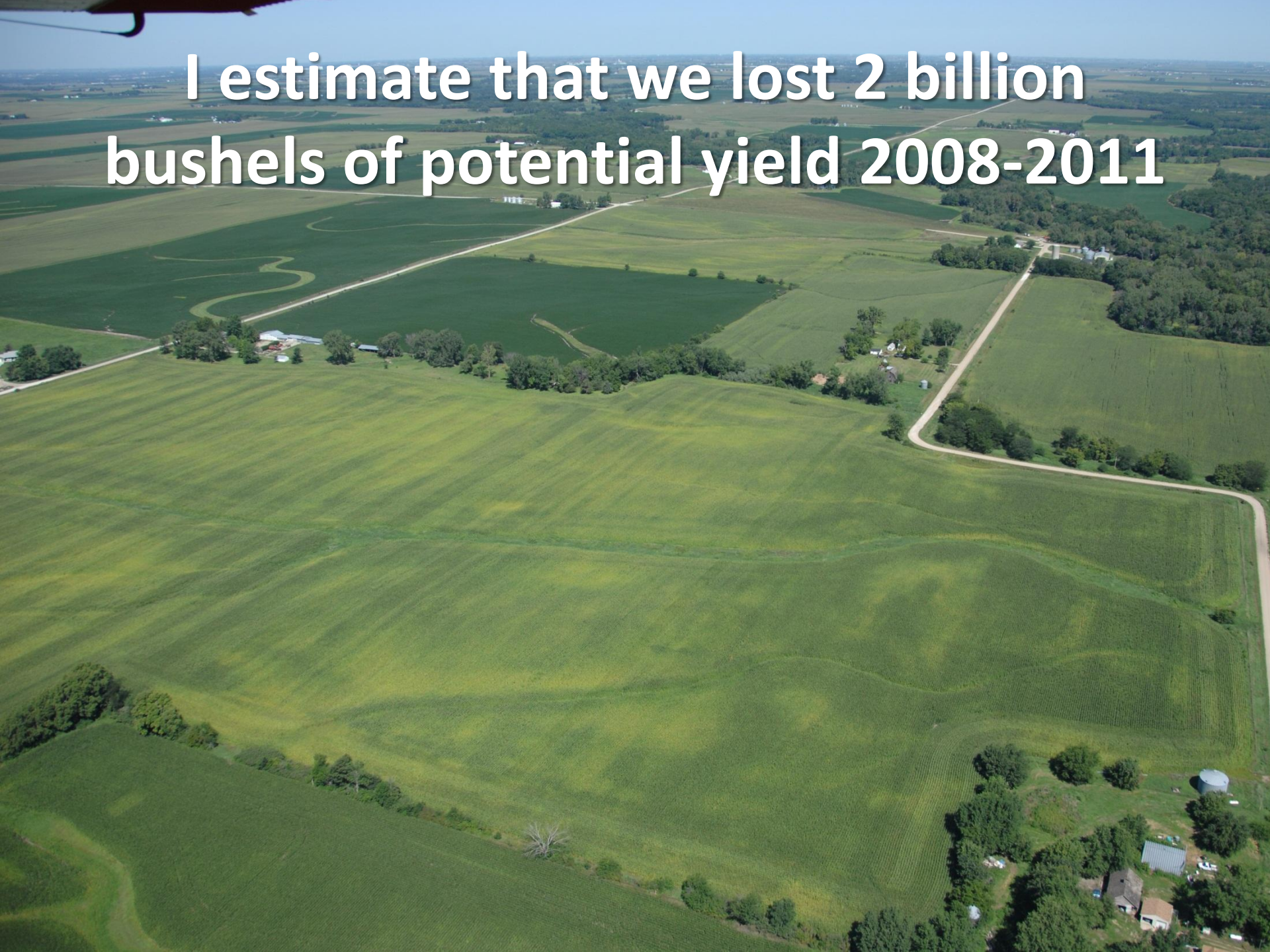


There was widespread N deficiency 2008-2011 across the Corn Belt

Central Iowa, August 2008



I estimate that we lost 2 billion bushels of potential yield 2008-2011



An aerial photograph of a vast, flat agricultural landscape in Central Iowa. The foreground and middle ground are dominated by large, rectangular fields of green corn. A light-colored dirt road or path runs diagonally across the lower right portion of the image. In the distance, there are scattered farm buildings, trees, and a small town or village under a clear, bright sky. The overall scene is a typical rural agricultural setting.

**Strategy 1: Don't let
your corn look like this**

How can you avoid it?



**In a wet year,
N must be
applied in-season**

How do I know that?

Central Iowa, August 2008

Central Missouri 2008:

in-season N kicks butt

+ 44 bu/ac

180 N

at planting

110 N

sidedress knee-high

Central Missouri 2009: in-season N kicks butt again

+ 68 bu/acre

153 N sidedress
153
Post knee-high

180 N
180
Pre at planting

140
PRE

180
PRE

147
SIDE

100
PRE

80 bu difference

**Central Missouri 2010:
Can you believe a 3-peat?**

0

197
SIDE

124
PRE

202
SIDE

Central Missouri 2013: N rate & timing

N timing	N rate	Yield
Knee-high	167 (chlorophyll meter)	213
Knee-high	174 (crop sensor, VR 67 to 191)	207
Knee-high	132 (soil nitrate test)	196
Preplant	180	126
Preplant	140	101
Preplant	140 (soil nitrate test)	94
Preplant	100	72
-----	0	51

**Sidedress N benefit in this
experiment 2007-2013 totals
about 260 bushels/acre**

All in the wet years: 2008, 2009, 2010, 2013

Wait! What about:
Anhydrous ammonia in April?
With N-Serve?
Or ESN?

Missouri 2013 (wet)

N source & timing

N timing	N source	Corn yield
April	Urea + Agrotain	120

Missouri 2013 (wet)

N source & timing

N timing	N source	Corn yield
April	Urea + Agrotain	120
April	ESN	143

Missouri 2013 (wet)

N source & timing

N timing	N source	Corn yield
April	Urea + Agrotain	120
April	ESN	143
April	Anhydrous ammonia	145
N-Serve didn't increase this yield		

Missouri 2013 (wet)

N source & timing

N timing	N source	Corn yield
April	Urea + Agrotain	120
April	ESN	143
April	Anhydrous ammonia	145
July (waist high)	Urea + Agrotain	162

**An all-preplant N program will
fail on most fields in a wet year**

**But a planned all-preplant N
program is OK**

**N lost in wet years can be
replaced**

Yellow corn can be rescued



- Fully fertilized fields but producers concerned
- N applied anywhere from thigh-high to tassel

Rescue N outcomes

- **Average yield response 34 bu/acre (11 fields)**
- **Yield response depended on visible stress**
 - High stress: 57 bushels (2 tests)
 - Medium stress: 41 bushels (5 tests)
 - Low stress: 14 bushels (4 tests)

Rescue N timing

- **How late is too late?**
 - Six tests in 2010, all applied at tasseling, ave 34 bu response
 - Tasseling is NOT too late
 - Give up by 2 weeks after tassel?

**How do I know
whether I need to
apply rescue N?**



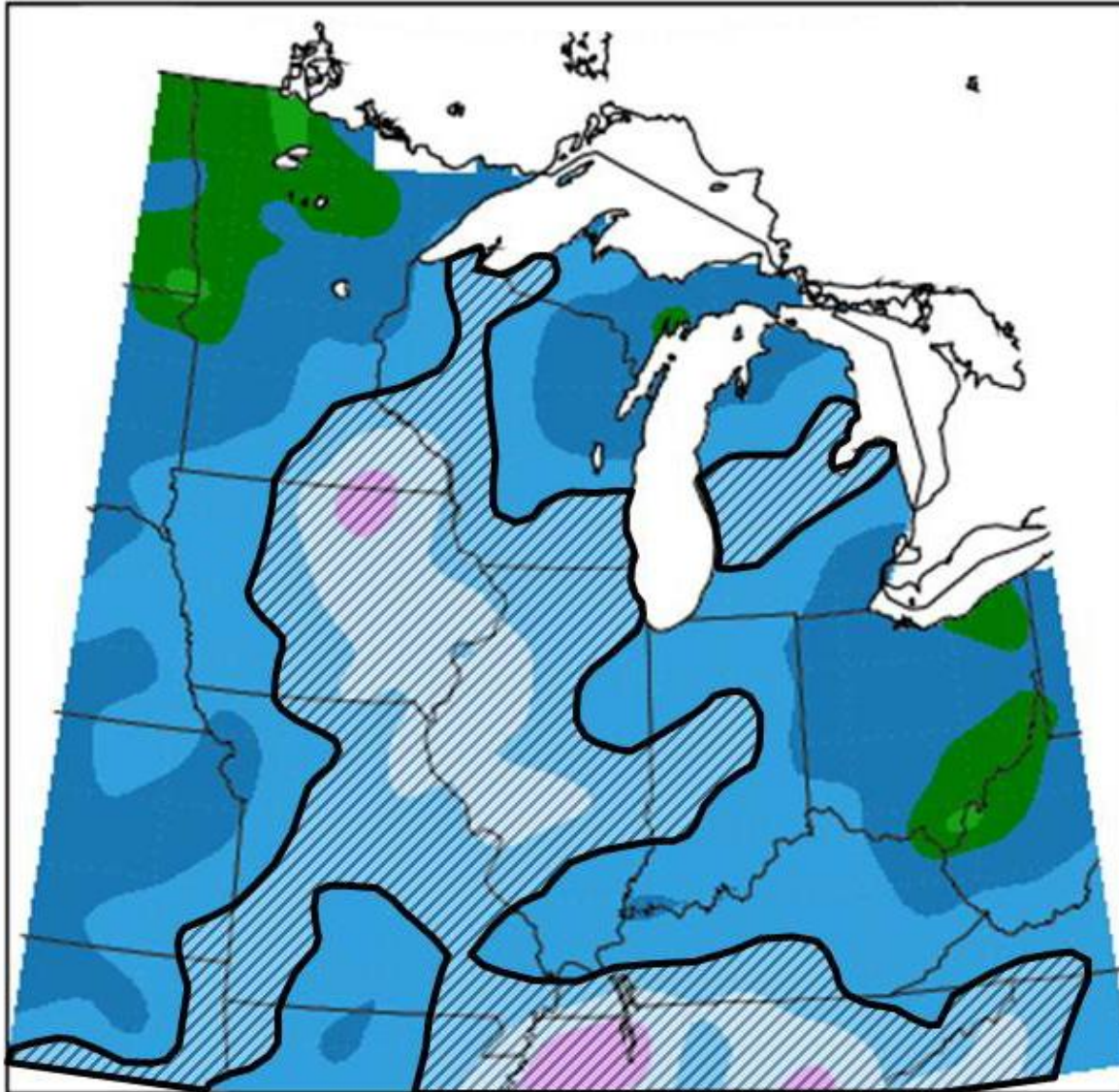
Good question

**Has it rained a lot since you
made your main N application?**

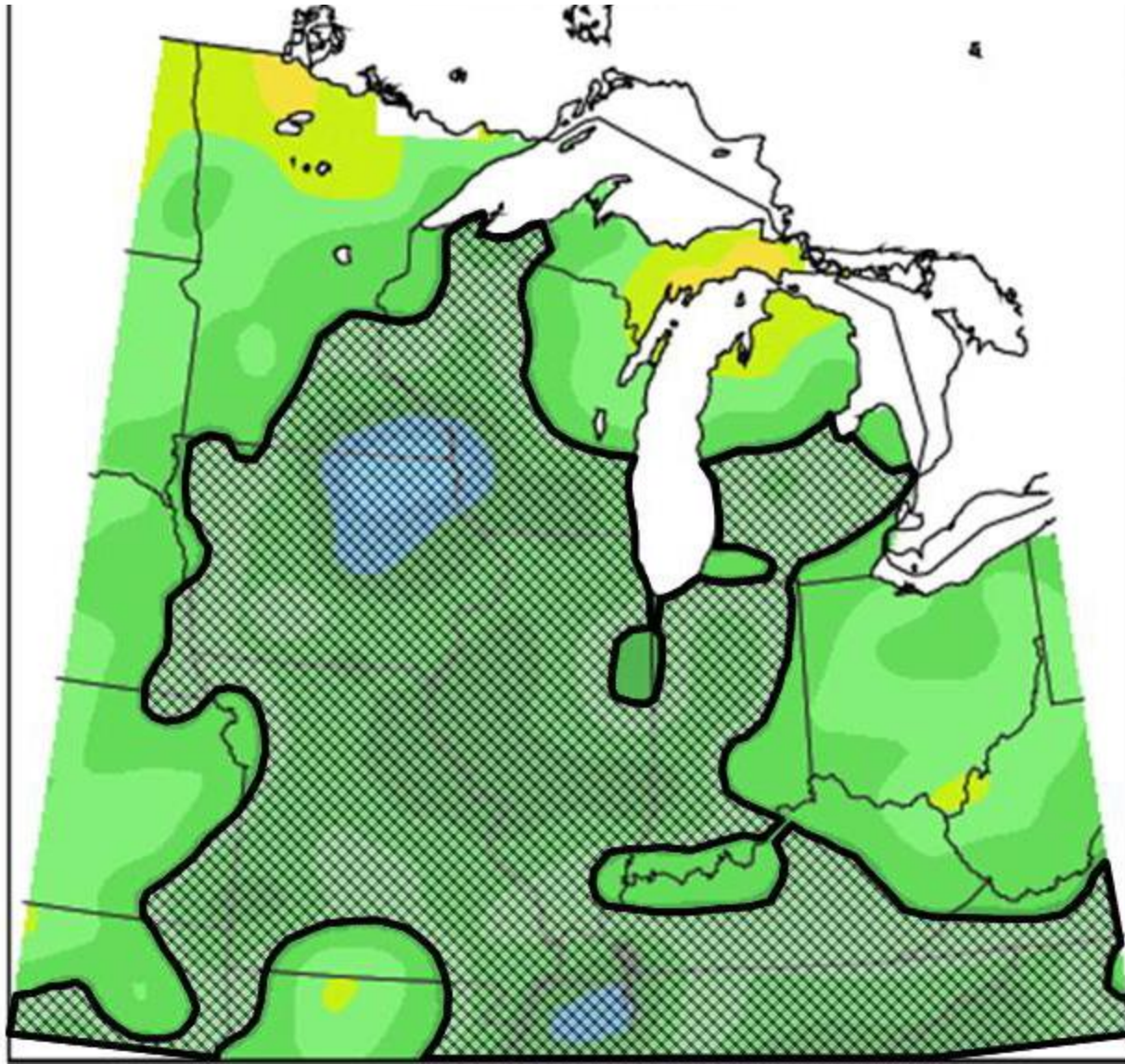
Nitrogen Watch: the first line of defense

- On my webpage
- Shows 'danger zones' that are on track for serious N loss
- Based on precipitation maps (from radar)
- Updated weekly until the end of June
- Separate maps for well-drained (leaching) and poorly-drained (denitrification) soils

Nitrogen Watch May 26, 2013



Nitrogen Watch June 30, 2013



**OK, I'm in the
'danger zone'.
Now what?**




**My best answer right now:
Get up in a plane
WITH A CAMERA**

But better options are coming

Adapt-N: the second line of defense

- Computer process model
- Online
- From New York
- Being commercialized right now
- Full commercial release before the growing season
- Quite a few field tests in Iowa with On-Farm Network, successful outcomes I think

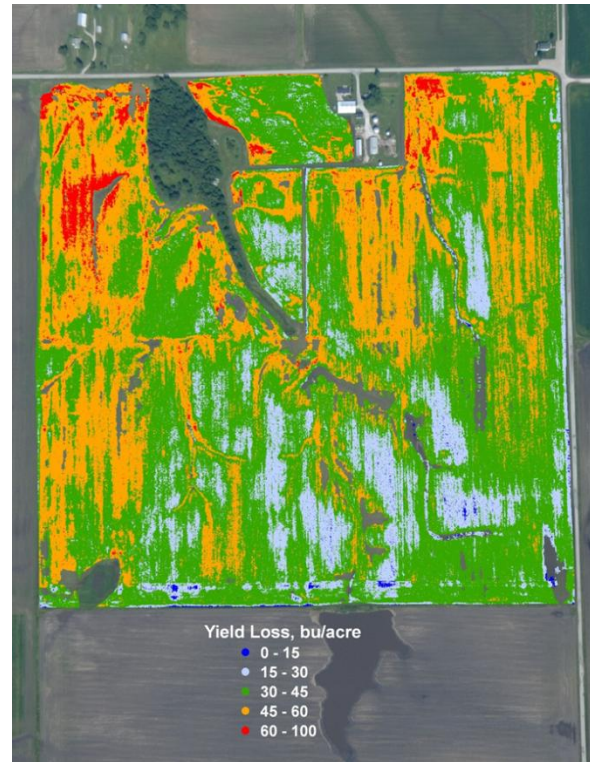
Adapt-N: the second line of defense

- Uses data on your soils, your N source & timing, your weather
- Requires you to input your soils & management 
- Should get you in the right ballpark
- I don't think it will reliably predict spatial variability in N deficiency

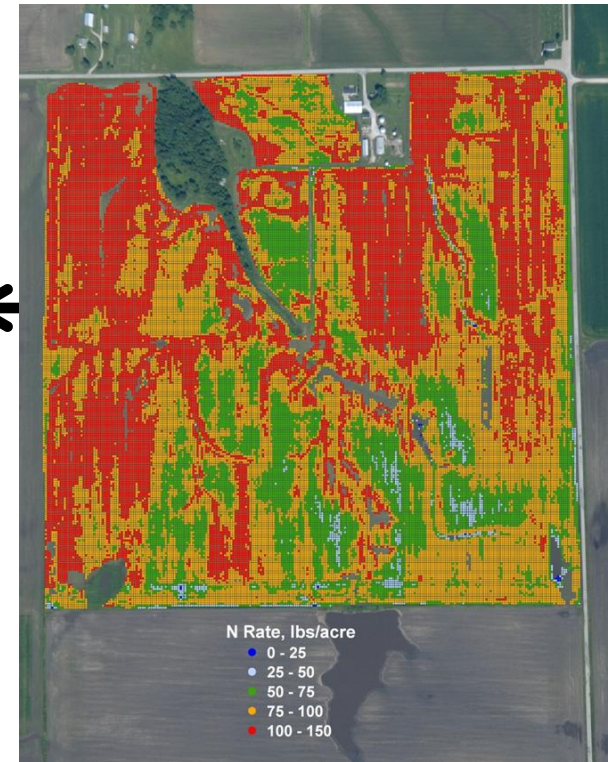
NVision: the third line of defense



Late June aerial photo



Predicted yield loss
(average 41
bu/acre)

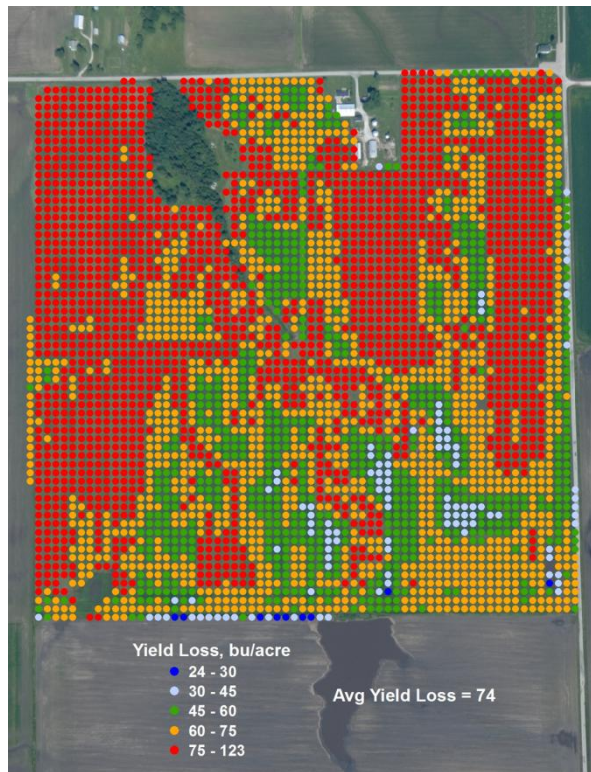


Predicted N need
(applicator-ready)

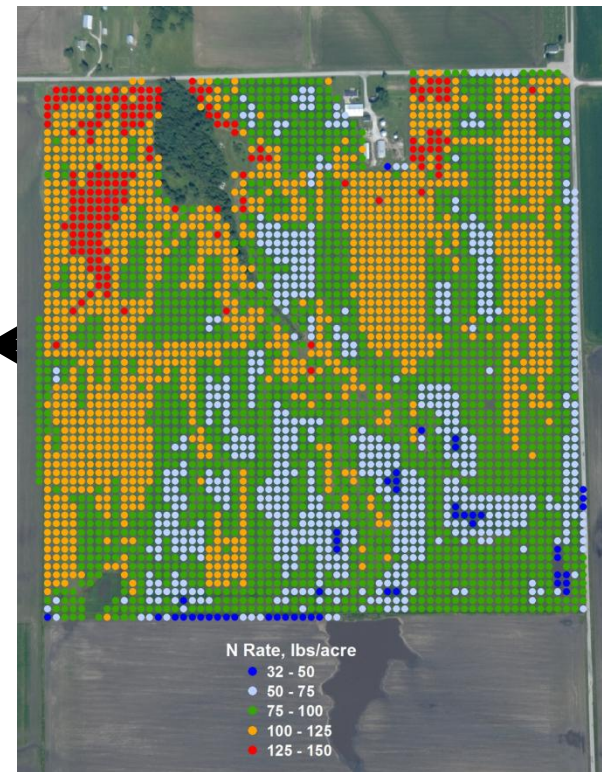
NVision: the third line of defense



aerial photo



yield loss map
(ave 74)



N rate map:
fix the problem

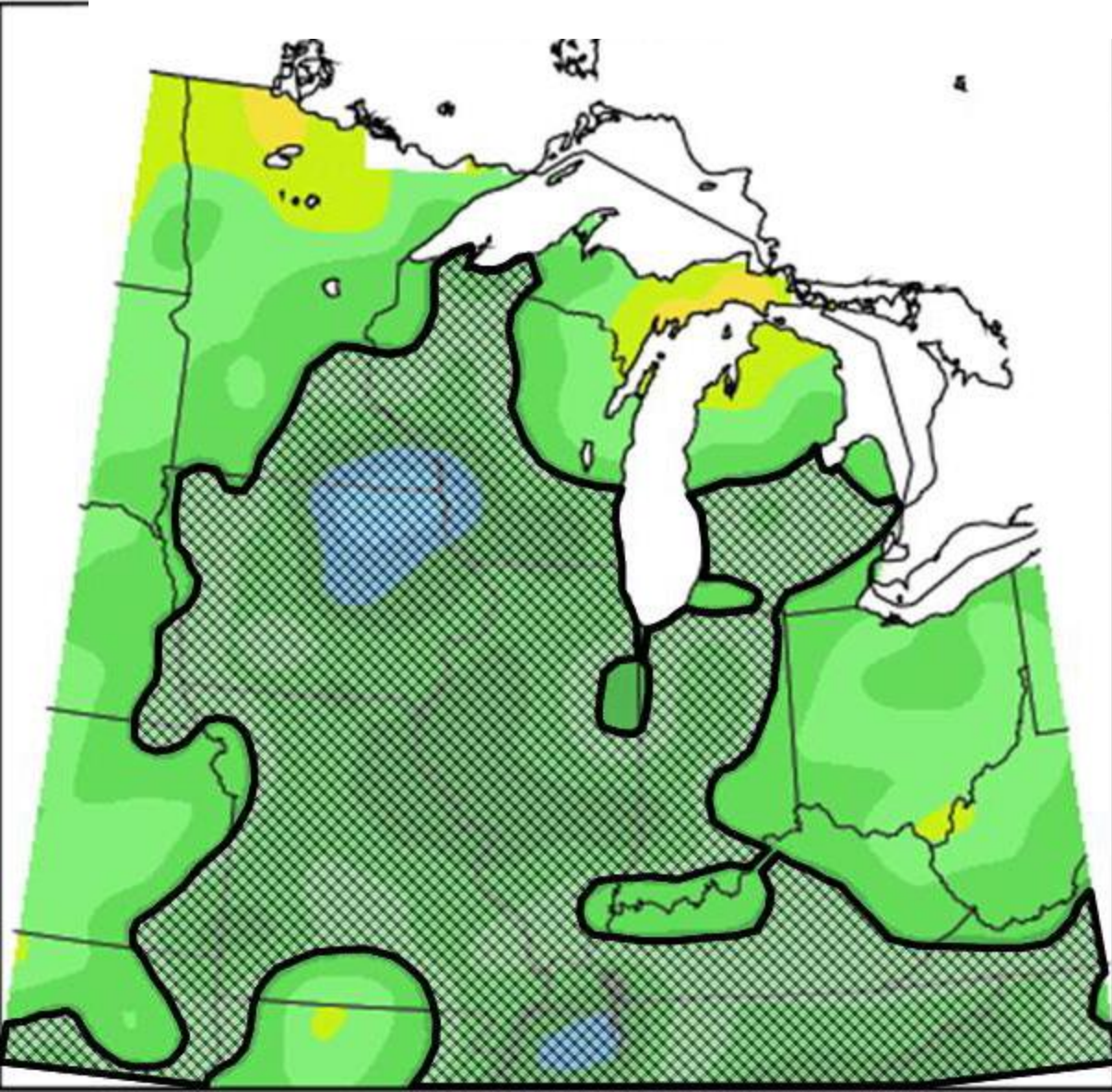
NVision: the third line of defense

- The numbers you need to make the right decision and take the right action
- Patented by University of Missouri (& me)
- I'm working hard to put together the right team (or find the right situation) to launch commercially for 2015
- Better than Adapt-N or other models to manage spatial variability (also more reliable?)

**How much do I really need to
think about this?**

**How many wet years are we
going to have?**

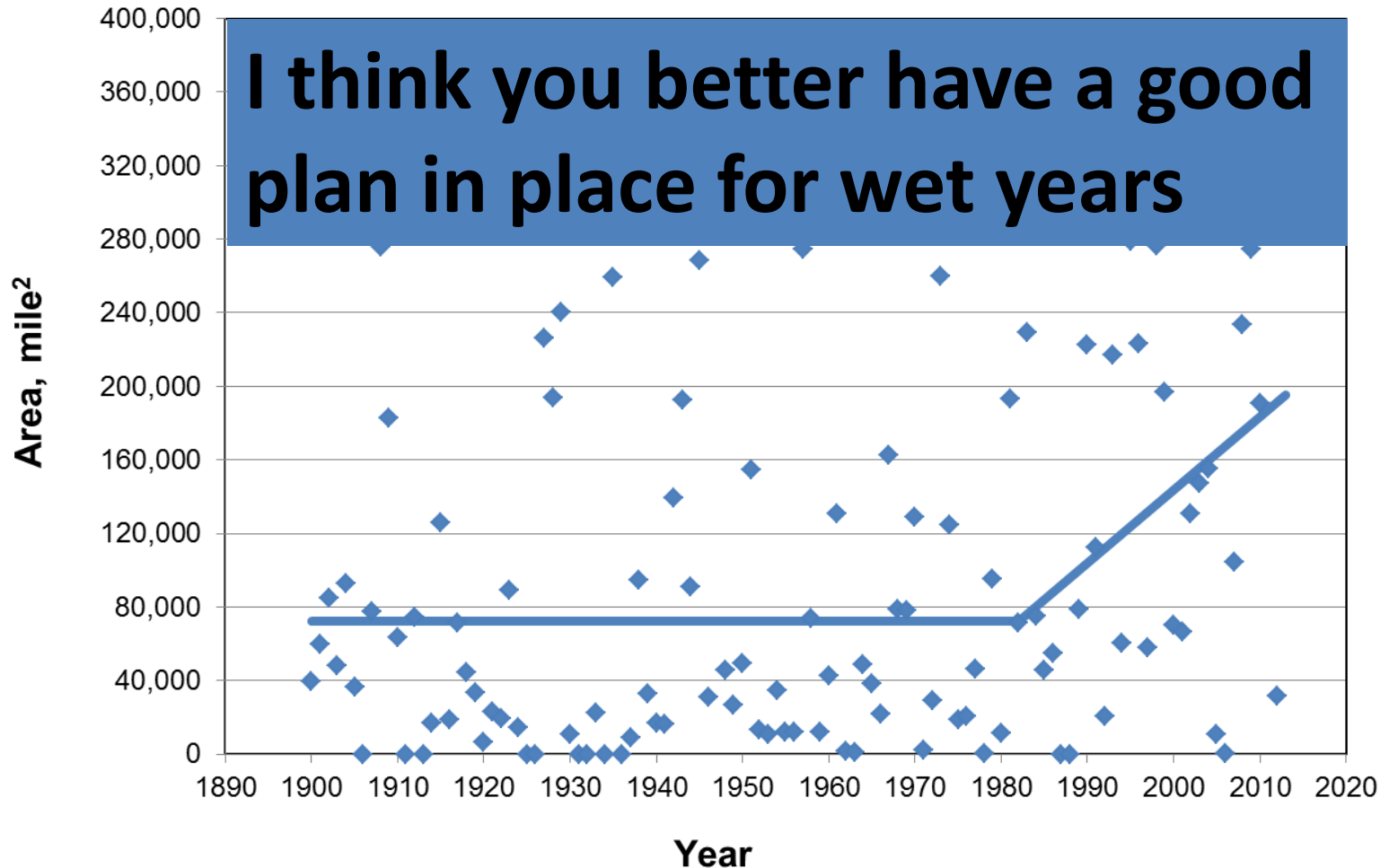
Nitrogen Watch May 26, 2013



We made maps like this for every year going back to 1900

More wet area in the central U.S.

Area with ≥ 16 inches of rainfall, April-June



Guess what?

We're getting there

2013: Far more in-season N than ever before

- Pioneer agronomist webinar June (mainly IA/MO)
 - On average expected 50% of acres to get in-season N
- Phone calls July: a dozen consultants, extension agronomists, and retailers in MO/IA/IL
 - On average thought 45% of acres had received in-season N
- Field day wagons northwest MO in August
 - $22/63 = 35\%$ of corn producers had applied in-season N
- I don't think it had ever been above 5% before

Shift gears....a little teaser

**I think that on-farm testing
is the wave of the future for
P & K management**

An aerial photograph of a rural landscape in Iowa. The scene is dominated by vibrant green fields, likely corn, which are divided into rectangular plots by thin lines. A winding river or stream flows through the center of the image. In the lower-left quadrant, a farmstead is visible, featuring a large red barn with a white roof, several smaller white buildings, and several large, cylindrical metal silos. A dirt road runs along the bottom left edge of the frame. The overall atmosphere is peaceful and agricultural.

Questions? Comments?

**Near Alexander, Iowa
July 22, 2013**